

## **AFFECTED ENVIRONMENT:**

### **Surface Water:**

All of the proposed well sites are located in the Upper Tongue River 4<sup>th</sup> Order Watershed (10090101), and the Tongue River Upstream from the Tongue River Dam 5<sup>th</sup> Order Watershed (10090101060). These well locations either drain to the Tongue River via ephemeral drainages, drain directly to the Tongue River, or drain to the Tongue River via Badger Creek (See Map 1). The entire length of the Tongue River from the Wyoming state line to its junction with the Yellowstone River is listed on the Montana Department of Environmental Quality's (MDEQ's) 1996 303(d) list for impaired streams under the Clean Water Act. Only the reach of the Tongue River from the diversion dam just above Pumpkin Creek to the mouth is listed on the MDEQ's 2002, or Draft 2004, 303(d) lists. This section of the stream is impaired due to flow alteration. Dam construction and flow regulation/modification are believed to be responsible for this impairment. The Tongue River Reservoir is also listed as impaired on the 1996, 2002 and Draft 2004 303(d) lists. This impairment results from high levels of Algal Growth/Chlorophyll. Domestic Wastewater Lagoons and Agriculture are believed to be responsible for these increased levels. The ephemeral and intermittent tributaries of the Tongue River in this area have not been listed as impaired.

The only proposed discharge associated with this project is directly into the Tongue River. A United States Geological Survey (USGS) Gaging Station (06306300) is located just upstream of this POD, near the Wyoming-Montana State Line. This station is shown on Map 1. Water quality and flow data from this station should be representative of this reach of the Tongue River. Additional USGS Stations considered in this analysis are located immediately below the Tongue River Dam (06307500) and near the southern boundary of the Northern Cheyenne Reservation (Birney Day School Station) (06307616). Major existing discharges into the Tongue River downstream from this site in Montana include the East and West Decker Coal Mines. No new CBNG discharges are being permitted in the Wyoming portion of the Tongue River watershed. Any existing Wyoming discharges are represented in the monitoring data collected at the USGS stations, and are considered as part of the existing environment.

Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) are the parameters most likely to be effected by CBNG development (BLM, 2003). Therefore the discussion in this report will focus on these parameters. EC is the ease with which water will transmit a current, and is proportional to salinity or total dissolved solids (TDS) concentration. SAR is a complex ratio of sodium vs. calcium plus magnesium, and is an important parameter for determining the usability of water for irrigation (BLM, 2003). SAR is defined as:

$$SAR = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}}$$

where all constituents are in milliequivalents per liter (meq/L).

Prior to issuing a MPDES permit the MT-DEQ must conduct an analysis for all parameters for which narrative or numeric standards have been developed. The BLM will not allow for the discharge of water from federal wells until a MPDES permit has been approved by the MT-DEQ for that discharge. The water discharged by this project would be discharged under Fidelity's existing MPDES permit (MT 0030457).

The existing water quality, as measured by EC and SAR, of the Tongue River at the State Line, Below the Dam, and at Birney Day School has been calculated for 7Q10 flows (the lowest flow

that would be expected to be seen for seven consecutive days over any 10 year period), high mean monthly (HMM) flows, and low mean monthly (LMM) flows. Water quality information was determined based upon historical USGS data with extrapolation of EC, Na, Ca, and Mg values to the flow rates of interest. This was done since the concentration of all of these constituents vary with flow. This can be seen on the Graphs of EC vs. Discharge and SAR vs. Discharge at the State Line Station, which are shown below. The results of this analysis are shown in Table 4 below.

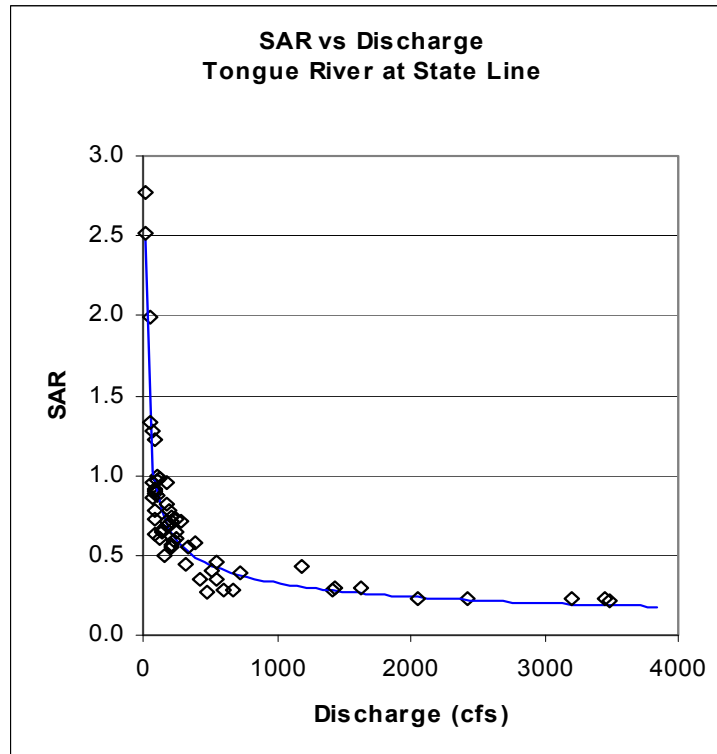
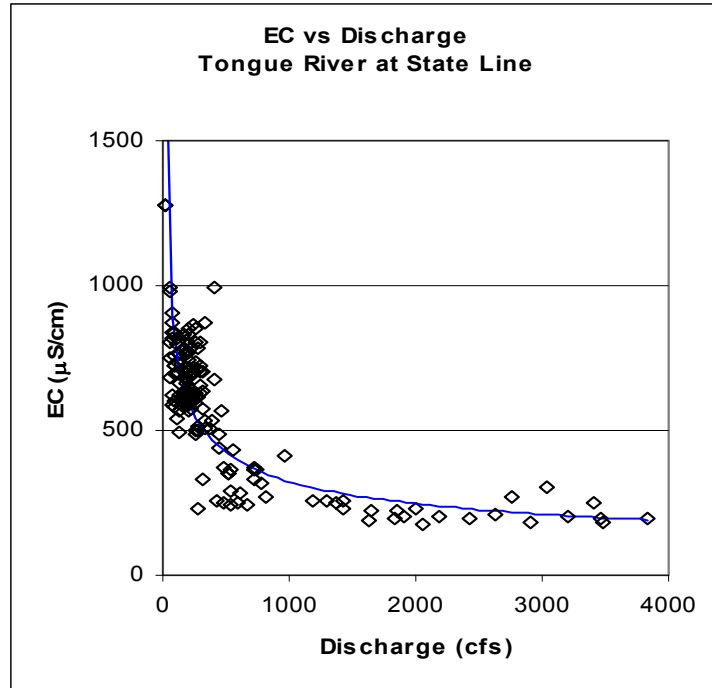


Table 4  
Existing Surface Water Quality

|      | Tongue River at State Line<br>Existing Conditions (1985-2002)* |            |      |
|------|--|------------|------|
|      | Flow (cfs)   | EC (μS/cm) | SAR  |
| 7Q10 | 35   | 1193       | 1.42 |
| LMM  | 176  | 636        | 0.70 |
| HMM  | 1638   | 267        | 0.26 |

|      | Tongue River Below Dam<br>Existing Conditions (1975-2002)* |            |      |
|------|--|------------|------|
|      | Flow (cfs)   | EC (μS/cm) | SAR  |
| 7Q10 | 23   | 1043       | 1.24 |
| LMM  | 173  | 657        | 0.70 |
| HMM  | 1429   | 281        | 0.28 |

|      | Tongue River at Birney Day<br>School<br>Existing Conditions (1979-2002)* |            |      |
|------|--|------------|------|
|      | Flow (cfs)   | EC (μS/cm) | SAR  |
| 7Q10 | 49   | 1125       | 1.56 |
| LMM  | 179  | 717        | 1.02 |
| HMM  | 1119   | 379        | 0.56 |

\* These values include the effects of CBNG in Wyoming. No new discharges into the Tongue River are being permitted in Wyoming.

The 7Q10 Values for the State Line and Birney Day School Station have changed from the original Badger Hills EA due to updated USGS data.

For additional general information regarding surface water, please refer to the MT-CBM-FEIS (BLM, 2003) Chapter 3, Affected Environment, pages 3-22 through 3-31 (BLM, 2003), the Water Resources Technical Report (ALL, 2001), and the Surface Water Quality Analysis Technical Report (SWQATR) (Greystone and ALL, 2003).

#### **Groundwater:**

The federal CBNG wells proposed to be drilled under this proposal would be between approximately 240 and 1,218 feet deep, being finished in the Dietz 1, Dietz 2, Dietz 3, Monarch, and Carney coal zones. Of the 85 federal wells, 14 would be completed in the Dietz 1 seam, 18 would be completed in the Dietz 2 seam, 17 would be completed in the Dietz 3 seam, 18 would be finished in the Monarch, and 18 would be finished in the Carney. The 92 state and fee wells would also be drilled into these same coal seams. All of these coal seams are contained within the Tongue River Member of the Fort Union Formation.

Based upon water analysis from 27 existing CBNG wells near the POD area the SAR of the CBNG water from the Dietz coal seams is expected to be approximately 53.2 and the EC is expected to be approximately 2,019 μS/cm. CBNG water from the Monarch coal seam is expected to have a SAR of approximately 71.8 and an EC of approximately 1,924 μS/cm. CBNG Water from the Carney coal seam is expected to have a SAR of approximately 60.8 and an EC of approximately 1,959 μS/cm. The resulting weighted mean CBNG water quality that results from

mixing these waters together proportional to the number of wells finished in each coal seam is a SAR of approximately 54, and an EC of approximately 1,987  $\mu\text{S}/\text{cm}$ . The water produced from the CX Field should also be similar to this quality

The water from these new wells would be handled with the water currently being produced in the CX Field. There are 246 existing CBNG wells in the CX field with an average discharge rate of 4 gallons per minute (gpm) for a current total of 984 gpm discharging to the Tongue River. The maximum discharge from the new wells is anticipated to be 14 gpm. It is anticipated that the discharge from the new wells would decrease at a rate of 20% per year, while the discharge from the existing wells would decrease at a rate of 30% per year. Using these assumptions the total project water production would increase to an initial maximum of 3,476 gpm, and total discharge would be 1,021 gpm after 5 years.

Due to the common clay rich layers in the Tongue River member of the Fort Union formation the vertical hydraulic conductivity of this unit is very low. Based upon the results of 370 aquifer tests Wheaton and Metesh (2002) have calculated that the geometric mean horizontal hydraulic conductivity values of the coal seam aquifers in the Fort Union Formation is 1.1 feet per day. Mean storativity values of these coals are approximately  $9 \times 10^{-4}$  (storativity is unitless) (Wheaton and Metesh, 2002). The average thicknesses of the produced coal seams from the well prognoses contained in the POD Book are as follows: Dietz 1 = 25 feet; Dietz 2 = 19 feet; Dietz 3 = 17 feet; Monarch = 22 feet; Carney = 23 feet.

The CX field CBNG development and Wyoming CBNG development are located adjacent to the Badger Hills project area. These developments are currently leading to the drawdown of local coal seams. In the Environmental Impacts section of this EA it is estimated that drawdown may extend up to 3.6 miles from CBNG developments in this area. If a 3.6 mile buffer is placed around the CX field and the Wyoming development, a total of 72 domestic or stock wells and 12 springs are located within the buffer (See Appendix G).

For additional general information on ground water, please refer to the CBM EIS (BLM, 2003), Chapter 3, Affected Environment pages 3-22 through 3-39 (ground water), the 2D Groundwater Report (Wheaton and Metesh, 2001) and the 3D Groundwater Report (Wheaton and Metesh, 2002).